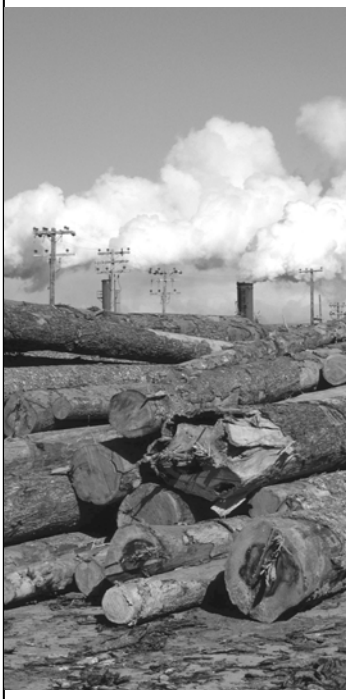
Work Related Asthma



One Washington Worker's Story...

"Jim" is a sawmill worker in his early thirties. He developed symptoms of shortness of breath and itching about one year after he started working in a mill that processed Western Red Cedar. At first, his symptoms were mild and sporadic and would clear over the weekends. His symptoms worsened over the next two years and he finally decided to seek treatment.

Jim's physician conducted several tests and diagnosed him with allergies and asthma caused by Western Red Cedar. Due to his sensitization to a chemical called plicatic acid in the wood's dust, his physician believed it would be in Jim's best interest to remove him from the workplace.

Jim was off work for an extended period of time while he underwent vocational retraining to gain employment in another trade. The total workers' compensation costs for this claim, including reimbursement for medical expenses and lost time from work, exceeded $63,000.

Work Related Asthma

Work-related asthma is a significant and preventable public health problem and was included as a priority condition in the first decade of the National Occupational Research Agenda (NORA).[1] In occupational medicine clinics; occupational asthma is the most frequently diagnosed occupational respiratory disease.

Work-related asthma can generally be categorized into three main types:

1. **Occupational Asthma** – new-onset asthma resulting from sensitization to a substance at work after a period of latency, also referred to as sensitizer-induced or immunologic asthma.
2. **Reactive Airways Dysfunction Syndrome (RADS)** – new-onset asthma symptoms immediately following exposure to high levels of an irritant in the workplace,[2] also referred to as non-immunologic or irritant-induced asthma.
3. **Work-Aggravated Asthma** – pre-existing asthma that is exacerbated by chemicals, smoke, fumes, or dust in the workplace.

Past surveillance and research of work-related asthma has resulted in significant knowledge of the causes and triggers of asthma generally. This is partly due to the fact that workers are exposed to a vast array of chemicals, sometimes at high levels or for extended periods of time.

It has been suggested that much can be learned regarding the causes, exacerbation, management and cure of asthma in the general population from continued study of asthma in the workplace.[3]

Work-related asthma is the most common occupational lung disease and can cause significant morbidity and disability. The proportion of adult asthma that can be attributed to workplace exposures has been estimated to be about 15%.[4-6] These estimates include both occupational asthma as well as work-aggravated asthma.

In Washington State, a total of 1,377 workers' compensation claims were filed for work-related asthma during the eight-year period from 1995-2002.[7] Over half the claims (57%) were filed by women, and claimants ranged in age from 15 to 77 years, with an average age of 41 years.

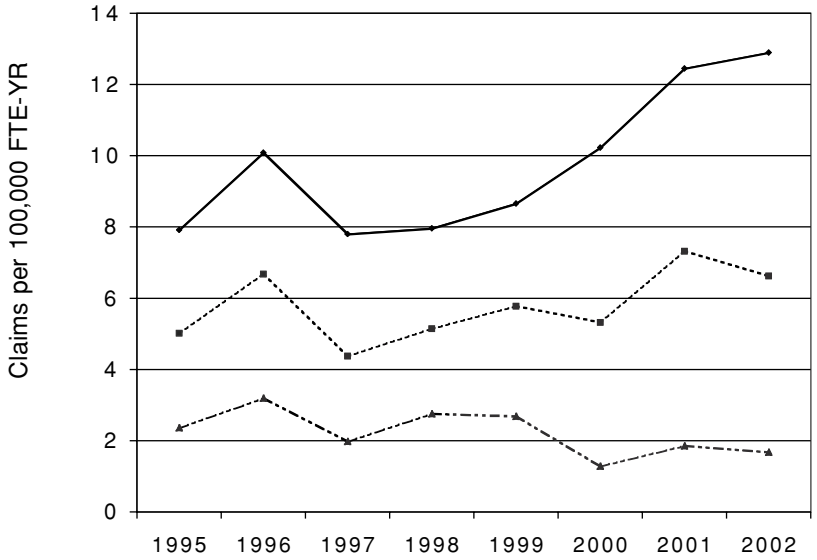
Costs incurred by the 1,099 work-related asthma claims paid by the state-operated workers' compensation system (i.e., State-Fund) totaled $12 million, or an average of nearly $11,000 per claim. Over $5 million of the total costs went toward reimbursement of almost 79,000 lost workdays, and $1.2 million went toward permanent partial disability payments for workers who developed permanent breathing problems.

The workers' compensation claims rate for filed claims related to asthma increased significantly from 7.9 to 12.9 per 100,000 per full-time equivalent employees (FTE) during 1995-2002 period (see Figure 1). The rate of accepted claims also increased from 5.0 to 6.6 per 100,000 FTE. The rate of compensable claims (i.e., those claims with at least 4 lost workdays) decreased over this time period.

These trends suggest an increasing incidence of work-related asthma claims in Washington, despite an overall decreasing incidence rate for all cause State-Fund claims.[7-8]

1. National Institute for Occupational Safety and Health. *National Occupational Research Agenda: Asthma and Chronic Obstructive Pulmonary Disease Additional Information*. Accessed at: http://www2a.cdc.gov/nora/NaddinfoAsthma.html on June 21, 2005.
2. Brooks SM, Weiss MA, and Berstein IL. (1985). Reactive Airways Dysfunction Syndrome (RADS): Persistent Asthma Syndrome after High Level Irritant Exposures. *Chest*, 88(3): 376-384.
3. Petsonk EL. (2002). Work-Related Asthma and Implications for the General Public. *Environmental Health Perspectives*, 110(suppl 4): 569-572.
4. Blanc PD and Toren K. (1999). How Much Adult Asthma Can Be Attributed to Occupational Factors? *American Journal of Industrial Medicine*, 107(6):580-587.
5. Mannino DM. (2000). How Much Asthma is Occupationally Related? *Occupational Medicine: State of the Art Reviews*, 15(2): 359-369.
6. Balmes J, Becklake M, Blanc P, Henneberger P, Kreiss K, Mapp C, Milton D, Schwartz D, Toren K, Viegi G; Environmental and Occupational Health Assembly, American Thoracic Society. (2003). American Thoracic Society Statement: Occupational contribution to the burden of airway disease. *American Journal of Respiratory and Critical Care Medicine*, 167(5):787-97.
7. Curwick C and Bonauto D. (2003). Work-Related Asthma in Washington State: A Review of Workers' Compensation Claims from 1995-2002. Technical Report Number 64-6-2003. Safety & Health Assessment & Research for Prevention (SHARP) Program, Washington State Department of Labor and Industries, Olympia, Washington.
8. Silverstein B, Kalat J, Fan ZJ. (2003). *Work-related Musculoskeletal Disorders of the Neck, Back, and upper Extremity in Washington State, State Fund and Self Insured Workers' Compensation Claims, 1993-2001*. Technical Report 40-7-2003. Safety & Health Assessment & Research for Prevention (SHARP) Program, Washington State Department of Labor and Industries, Olympia, Washington.

Figure 1: Trend in Work-Related Asthma Claims Rates, Washington Department of Labor and Industries' State-Fund Workers' Compensation Claims Data



Source: *The Burden of Asthma in Washington State Report*. DOH 2005.

Work-related asthma occurs in a very large number of industries as a result of a diverse array of exposures. In order to make a measurable impact on the morbidity of work-related asthma in Washington, multiple industries and hazards must be targeted for prevention. The following types of work are highlighted as high priorities based on relatively high workers' compensation claim frequencies and rates: sawmills; the manufacturing of plastic, wood, and fiberglass products; clerical work in state government; and medical clinics.[7] Other industries identified as potential priorities for intervention include the spray-on truck bed lining industry[9] and auto body repair shops10, both of which have workers exposed to isocyanates, well-documented respiratory sensitizers.

Fifty-seven percent of workers' compensation claims for work-related asthma are filed by women.[7] This is in contrast to the much lower proportion of all workers' compensation claims that are filed by women (32%).[8] This finding appears to be consistent with results from the BRFSS survey that reveal a higher prevalence of asthma among adult women (11.2%) compared to men (6.9%).

Environmental Factors

According to the criteria established by the Association of Occupational and Environmental Health Clinics for designating substances as occupational asthmagens, there are currently over 350 substances known to cause asthma in the workplace.[11] These include chemicals, dusts, metals, plant and animal materials, and proteins, among others. Table 2 provides a listing of selected asthmagens and the common occupations where exposures occur.

9. Lofgren DJ, Walley TL, Peters PM, Weis ML. (2003). MDI Exposure for Spray-On Truck Bed Lining. *Applied Occupational and Environmental Hygiene*. 18:722-779.
10. Sparer J, Stowe MH, Bello D, Liu Y, Gore RJ, Youngs F, Cullen MR, Redlich CA, Woskie SR. (2004). Isocyanate Exposure in Autobody Shop Work: The SPRAY Study. *Journal of Occupational and Environmental Hygiene*. 1:570-581.
11. Beckett WS. (2002). *Revised Protocol: Criteria for Designating Substances as Occupational Asthmagens on the AOEC List of Exposure Codes*. Accessed from: http://www.aoec.org/Asthmagen_Pro_7-25-02.pdf on January 24, 2005.

Table 2: Selected Causes of Occupational Asthma and

Typical Occupations Related to Exposure

Asthma Causing Agent	Occupation of Exposure
Animals	
Animal urine, proteins and other allergens	Animal handlers in laboratories, research scientists
Grain mite	Farmers, grain-store workers
Prawns, crabs	Seafood processors
Egg protein	Egg producers
Plants	
Grain dust	Grain storage workers
Flour of wheat, rye soy	Bakers, millers
Latex	Health-care workers
Green coffee bean	Coffee roasters
Henna	Hairdressers
Gum acacia	Printers
Enzymes	
Derived/Proteases from Bacillus subtilis	Detergent industry workers
Pancreatin, papain, pepsin	Pharmaceutical industry workers
Fungal amylase	Bakers
Wood dusts or barks	
Western red cedar, iroko, cinnamon, oak, mahogany, African apple, redwood	Sawmill workers, joiners, carpenters
Chemicals	
Diisocyanates	Polyurethane, plastics, varnish workers
Phthalic/acid anhydride	Plastic, epoxy resins, alkyd resins workers
Ethylene diamine/complex amines	Photography, shellac workers, painters
Azodicarbonamide	Plastics, rubber workers
Reactive dyes	Dyeing, textile workers
Methyl methacrylate	Health-care workers
Drugs	
Penicillins, psyllium, methyldopa, cimetidine, salbutamol intermediates	Pharmaceutical, health-care workers
Metals	
Halogenated platinum salts	Platinum-refining workers
Cobalt	Hard-metal grinders
Chromium, nickel	Metal-plating workers
Other	
Oil mists	Tool setters
Metal-working fluids	Machinists
Aluminum potroom emissions	Aluminum-refining workers
Colophony in soft solder flux	Electronics workers

Source: Modified from Venables, 1997.[12]

Exposure types are related to specific job conditions and equipment or materials. The wide variety of worksites and exposures makes development of effective safety measures and education of worksite managers challenging. One exposure present in a variety of worksites is secondhand smoke. State law bans smoking in most workplaces (Chapter 70.94 RCW,

12. Venables KM and Chan-Yeung M. (1997). Occupational Asthma. *The Lancet*, 349:1465-1469.

Washington State Clean Indoor Air Act) but restaurants, bars, casinos, and some other worksites are currently exempted from that ban.

A recent survey of large worksites in Washington found that about 43% of restaurants allow smoking, as well as 11% of warehouses, one in five mixed businesses (including agricultural and industrial facilities), and a small proportion of nursing homes.[13] Worksites such as restaurants, bars, and casinos are of particular interest because the visiting public may be exposed to smoke the same as the workers. Refer to the *Asthma and the Environment* chapter and the *Policy and Advocacy* section of the *Cross-Cutting Issues* chapter for more discussion on smoking.

Workers who develop occupational asthma as a result of a sensitizer in the workplace should be completely removed from the exposure. Even very low levels of sensitizing agents (such as isocyanates) can cause asthma in sensitized individuals. Early diagnosis and exposure cessation can lead to better health outcomes.[14] As exposure cessation often translates to removal from the workplace, an appropriate diagnosis of occupational asthma using objective testing to both diagnose the asthma and to attribute it to the workplace is critical.

For workers with work-aggravated asthma or irritant-induced asthma, steps should be taken to eliminate or reduce the levels of the exposure as much as possible. If substitution of the irritant chemicals for non-irritant chemicals is not possible, the next most effective way to mitigate exposures is through engineering controls to reduce the level of the substance that reaches the worker. An example of an engineering control is the installation of local exhaust ventilation to remove the substance before it enters the work environment. If engineering controls are not available or feasible, then administrative controls, such as changing work patterns or training workers to follow safe work practices should be implemented. Personal protective equipment, including approved respirators and coveralls, should always be the last line of defense and should not be considered primary control methods.

An additional concern involves "take-home" exposures by workers to their families. For instance, one study suggests that children's exposure to pesticides, through the occupational use of pesticides by household members, was associated with asthma and other respiratory disease.[15] Furthermore, workers with home businesses or hobbies involving sensitizing agents, such as some paints, have the potential to be hazards for family members.

Policy Issues

In Washington State, the Department of Labor and Industries (L&I) is responsible for establishing and enforcing workplace safety and health rules through the Washington Industrial Safety and Health Act (WISHA).

While past occupational health research and surveillance activities have helped to identify hundreds of substances currently known to cause occupational asthma, very few of these substances have enforceable workplace exposure limits. This can likely be attributed to a number of factors, including very limited scientific evidence regarding exposure-response relationships; current controversy concerning the existence of thresholds or safe levels of exposure at which sensitizing agents do not induce asthma; and technical limitations in the measurement of the very low exposure levels in which these sensitizing agents may likely initiate asthma.[16]

If future research becomes available regarding exposure-response relationships for specific sensitizing agents, careful consideration should be made at that time regarding the development of scientifically sound exposure limits.

13. Dilley, J., Pizacani, B., Macdonald, S., & Bardin, J. (2005). *The Burden of Asthma in Washington State*. Olympia, WA: Washington State Department of Health. pg:114
14. Lin FJ, Dimich-Ward H, Chan-Yeung M. (1996). Longitudinal Decline in Lung Function in Patients with Occupational Asthma due to Western Red Cedar. *Occupational and Environmental Medicine*. 53:753-756.
15. Salameh PR, Baldi I, Brochard P, Raherison C, Abi Saleh B, Salamon R. (2003). Respiratory symptoms in children and exposure to pesticides. *European Respiratory Journal*, 22:507-512.
16. Cullinan P, Tarlo S, Nemery B. (2003). The Prevention of Occupational Asthma. *European Respiratory Journal*, 22:853-860.

Current Activities

The Safety & Health Assessment & Research for Prevention (SHARP) program at L&I currently maintains a surveillance and prevention program for work-related asthma. Since September of 2000, the SHARP program has been collecting cases of work-related asthma, including occupational asthma and work-aggravated asthma, using both workers' compensation claims data as well as physician reports (work-related asthma is currently a reportable condition under Washington State's notifiable conditions rule). Additionally, since October 2001, SHARP has been conducting case follow-up interviews with workers to collect more detailed information about workers' asthma and associated exposures.

In addition to surveillance system maintenance and data analysis, SHARP's activities have included outreach with employers, employees, and health care providers. These activities have included the development and dissemination of surveillance reports and educational materials, as well as employer site visits, presentations, and various publications.

In addition, individual employers in Washington State may be taking steps to reduce their employees' exposures to chemicals, smoke, fumes, or dusts. For instance, several employers have invited SHARP's industrial hygiene and asthma program staff for worksite visits to assess exposures and provide recommendations for exposure reductions. Further, one Washington employer is currently working with employees to study methods for reducing employee exposure to hexavalent chromium.

The current approach taken by the SHARP program at L&I has been to focus information and prevention activities toward three primary audiences: employers, employees and health care providers.

Outreach to health care providers regarding work-related asthma diagnosis and management is essential since current medical care often lacks the objective medical testing necessary to diagnose asthma and document its relationship to the workplace.[17] Such rigorous objective testing is necessary because a medical history and physical exam lack both the sensitivity and specificity of diagnostic tests for asthma.[18] Improvements in work-related asthma diagnosis and management greatly benefit both the worker and employer, helping to ensure that workers are not inappropriately removed from the workplace and that years of productive work are maintained.

Continued outreach to the health care provider community is warranted until objective testing to diagnose asthma and attribute its cause to the workplace become common practice. Additionally, SHARP's past outreach to physicians and other health care providers have included information on work-related asthma as a reportable health condition in Washington State. To date, these efforts have been resource-intensive and have not resulted in noticeable improvements in reporting rates.[19] Innovative and cost-effective methods to educate health care providers regarding the reporting requirements for work-related asthma; possibly through collaborative efforts with other local and state agencies, organizations, and coalitions; should be explored.

The SHARP program has also focused its outreach efforts more heavily on employers (company owners, safety and health managers, etc.) rather than on employees, because employers are the ultimate decision makers when it comes to deciding whether and how to implement the most effective exposure control strategies. These past efforts, while limited due to a lack of dedicated industrial hygiene support for the work-related asthma program, have been effective in terms of raising awareness and providing recommendations for exposure reduction. Future industrial hygiene visits will strive to follow-up with employers who adopt change to measure the impact of interventions in terms of reduced worker exposures. Of course, this is dependent on employer response and voluntary adoption of prevention strategies.

17. Rosenman KD, Reilly MJ, Kalinowski DJ. (1997). A state-based surveillance system for work-related asthma. *Journal of Occupational and Environmental Medicine*, 39(5):415-425.

18. Malo JL, Ghezzo H, L'Archeveque J, Lagier F, Perrin B, Cartier A. (1991). Is the clinical history a satisfactory means of diagnosing occupational asthma? *The American Review of Respiratory Disease*, 143:528-532.

19. Curwick C, Bonauto D. (2004). Interim Evaluation of Work-Related Asthma Surveillance and Prevention. Technical Report 64-3-2004. Safety & Health Assessment & Research for Prevention (SHARP) Program, Washington State Department of Labor and Industries, Olympia, Washington.

SHARP's current efforts with employees have focused on the dissemination of general educational materials on work-related asthma – its symptoms, causes, diagnosis, and prevention. Future efforts can be targeted to more specific employee groups, providing more detailed information on what employees can do to protect themselves from the specific asthmagens in their workplaces.

More generally, future outreach activities should include collaboration with other state and local agencies, organizations, and coalitions, to appropriately incorporate work-related asthma into existing and future asthma information and prevention activities targeted for the general public (e.g., brochures, health fairs, trainings, etc).

Work-Related Asthma

Goal 1: Reduce work-related asthma in Washington State

Objective WRA.1

Through 2010, increase education of asthmagens and asthma triggers in the workplace among physicians, employers, and employees

Strategies

- Develop and disseminate a continuing medical education monograph for physicians on work-related asthma diagnosis and management, including information on asthma-causing agents and common asthma triggers in the workplace
- Develop/identify and disseminate educational materials for employers on known asthma-causing agents in targeted industries via industry-wide mailings and publication in industry trade journals and newsletters
- Develop/identify and disseminate work-related asthma educational materials to workers, including all individuals reported to the work-related asthma surveillance system
- Collaborate with state agencies and coalitions and other groups conducting outreach to health care providers, employers, and the general public to include information about asthma-causing agents and common asthma triggers in the workplace

Objective WRA.2

Through 2010, decrease worker exposures to asthmagens and common asthma triggers in the workplace

Strategies

- Continue public health surveillance activities for work-related asthma to identify high-risk workplaces, industries, occupations, and exposure sources
- Support and conduct voluntary exposure assessments with select employers identified through surveillance efforts or in targeted industries. Provide site visit reports with findings and recommendations for exposure reduction. Provide technical assistance to employers wishing to adopt workplace changes to reduce exposures and follow-up to document actual exposure reductions
- Monitor the scientific literature for work-related asthma intervention effectiveness studies – consider feasibility of implementation in Washington workplaces

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